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UNIONICOLID MITES FROM CENTRAL NEW YORK

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Abstract.—Mites of the family Unionicolidae were collected from 110 freshwater bivalves in New York. Five species of adult mite were found. Of the dominant bivalves found in Conesus Lake, only *Lampsilis siliquoidea* (Barnes) contained adult mites. *Unionicola fossulata* (Koenike) infected 84.8% of this mussel and 75.3% of the nymphal and adult mites were found between the gills. There were 2.08 ± 0.12 mites per infected *L. siliquoidea.* At Spencer creek, *Unionicola arcuata* (Wolcott) and *Najadicola ingens* (Koenike) were found in *Alasmidonta undulata* (Say). *Unionicola formosa–ypsilophora* complex (Vidrine 1980) and *Unionicola tumida* (Wolcott) occurred in *Anodonta cataracta* (Say). In the case of *N. ingens* this is a new host record and the first published report of its occurrence in New York State. No nymphal or adult mites were found in 42 *Elliptio complanata* (Solander) from the two contrasting sites.

Introduction

Unionicolid mites parasitize freshwater mussels. The family has been studied by a number of workers in North America including Wolcott (1899), Mitchell (1955, 1957, 1965a), Cook (1974), and Vidrine (1977, 1979, 1980). In particular Mitchell (1965b) studied population densities and regulation of *Unionicola fossulata* (Koenike) in *Lampsilis siliquoidea* (Barnes), and Gordon, Swan and Paterson (1979) and Paterson and Macleod (1979) the biology of *Unionicola formosa* (Dana and Whelpley) in *Anodonta cataracta* (Say). *Najadicola ingens* (Koenike) has been studied by Humes and his coworkers (1950, 1951, 1952).

Materials and Methods

Collections were made using a hand net in shallow water and by SCUBA diving to reach a depth of 7.5 m the maximum at which bivalves occurred.

The mussel collections were examined as soon as possible on return to the laboratory. The number and location of the active mites within each mussel was noted and estimates were made of the numbers per host of eggs, prelarvae and nymphochrysalids. Prelarvae and nymphochrysalids were dis-

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sected from the mantle and gills respectively. Specimens of all stages were preserved in Koenike's fluid.

Results

Five common species of freshwater mussels were collected from two contrasting sites.

Conesus Lake is part of the St. Lawrence River system. It is situated south of Rochester and is the most westerly of the Finger Lakes system. A total of 88 mussels were collected made up as follows: 46 *L. siliquoidea,* 38 *Elliptio complanata* (Solander) and 4 *Anodonta grandis* (Say). The only adult mite found was *U. fossulata* in L. *siliquoidea. E. complanata* contained the developmental stages of a transient species but no nymphal or adult mites.

Spencer Creek the out-flow channel of Spencer Lake is situated in the town of Spencer, south of Ithaca and forms the northern part of the Susquehanna River system. A total of 22 mussels were collected, in running water of up to 1 m depth made up as follows: 11 *Alasmidonta undulata* (Say), 7 *A. cataracta* and 4 *E. complanata. N. ingens* and *U. arcuata* were found in *A. undulata.* Of the 7 specimens of *A. cataracta* 2 contained *U. tumida.* The other 5 contained a species of *Unionicola* closely resembling *U. formosa* (Dana and Whelpley) but the males have a discrete posterior border on coxal plate IV as in *Unionicola ypsilophora* (Bonz). They have been referred to as the *U. formosa–ypsilophora* complex by Vidrine (1980).

U. fossulata in L. siliquoidea.—In *L. siliquoidea* 39 out of the 46 specimens contained nymphal and adult stages of *U. fossulata,* a 84.8% level of parasitization by the active stages. In addition most contained unionicolid eggs and prelarvae in the mantle and nymphochrysalids in the gills.

A total of 81 nymphs and adults of *U. fossulata* were found in the infected specimens of *L. siliquoidea* averaging 2.08 ± 0.12 mites per mussel. These were made up as follows: 35 males, 41 females and 5 nymphs (Table 1). Of the infected mussels, 89.7% had a male, never more than 1 per mussel and 61.5% had 1 male and at least 1 female. If 1 adult mite was present it was

Table 1. Nymphs and adults of *Unionicola fossulata* infecting the mussel *Lampsilis siliquoidea.*

Mite	Total numbers	Mean number per infected host	Mean number per total number host
Males	35	0.90 ± 0.05	0.76 ± 0.06
Females	41	1.05 ± 0.13	0.89 ± 0.13
Nymphs	5	0.13 ± 0.05	0.11 ± 0.05
All stages	81	2.08 ± 0.12	1.76 ± 0.15

46 *L. siliquoidea* examined, 39 infected with active stages.

most frequently a male, if 2 mites were present they were normally male and female and when 3 adults occurred in the mussel, 1 male and 2 females were found.

The nymphal and adult mites of *L. siliquoidea* showed a preferred location with respect to the gill surface. Table 2 refers to these results. The site numbers are those used by Davids (1973). 75.3% of the mites occurred between the gills, 17.3% between the gills and the foot and only 2.5% were found between the outer gill surfaces and the mantle.

Measurements of the developmental stages indicated that 1 type of *Unionicola* was present in *E. complanata* and 4 types in *L. siliquoidea,* one of which is the same as that found in *E. complanata* (Jones, personal communication). Identification to species is not possible since detailed descriptions of most American unionicolid larvae are not yet available.

N. ingens in A. undulata.—N. ingens is an endobranchial parasitic mite of freshwater bivalves. It belongs to the family Unionicolidae Oudemans 1909 and is the only genus and species in the subfamily Najadicolinae Viets 1935.

N. ingens was found only in *A. undulata.* 11 specimens of this bivalve were collected, 8 were infected and a total of 15 adult *N. ingens* recovered.

The presence of *N. ingens* in *A. undulata* is a new host record. The present report is also the first published account of *N. ingens* being found in New York State although student project reports from "The International Field Workshop on Aquatic Invertebrates," 1978, St. Lawrence University, U.S.A, listed *N. ingens* in 7 specimens of *Strophitus undulatus* from Grannis Brook (St. Lawrence County, New York) as well as an unstated number of infected *Anodonta* sp. (Crowell, personal communication).

N. ingens has previously only been recorded within the gills of its hosts. In the present collection 7 out of a total of 15 mites were found inside the pericardial region of 6 specimens of *A. undulata.*

Discussion

The dominant bivalves in Conesus Lake are *L. siliquoidea, E. complanata* and *A. grandis* (Clarke and Berg 1959). The first 2 show an interesting comparison with regard to parasitism by unionicolid mites. Although both harbour immature resting stages, only *L. siliquoidea* had resident nymphal and adult mites. *E. complanata* accommodates the transforming developmental stages of a single species of unionicolid. Adult female mites must visit this mussel in order to lay eggs and then leave. *L. siliquoidea* appears to be the natural host for *U. fossulata* and the preferred host for other species of immature transient unionicolids in this lake. Mitchell (1955) working in Michigan, found four species occurred together in *L. siliquoidea* namely *U.*

Table 2. Distribution of *Unionicola fossulata* in infected *Lampsilis siliquoidea.*

Site in the mussel	Total numbers of active nymphs and adults at each site
I	1
II	29
III	14
IV	32
V	1
VI	4

Site numbers are those used by Davids (1973).

fossulata, U. abnormipes, U. serrata and *U. aculeata* of which only the latter was transient.

Adult mites were most frequently found between the gills and to a lesser extent between the gills and the foot, which agrees with the work of Mitchell and Pitchford (1953) for *U. ypsilophora,* Mitchell (1965b) for *U. fossulata* and Davids (1973) but is in contrast to the findings of Gordon, Swan and Paterson (1979) who worked on *U. formosa.* The latter workers frequently found mites on the outer surface of the gills.

Although seasonal collections were not made both Mitchell (1965b) and Gordon, Swan and Paterson (1979) found there were no significant seasonal changes in the total number of mites in all stages or in the percentage infection. The present results agree closely with the findings of Mitchell (1965b).

A number of authors previously described *N. ingens* as rare or infrequent but it has now been recorded from 16 states in North America, from Canada and recently from Thailand (Vidrine, personal communication). New York State can now be added to this list.

The new host reported here further supports the view of Vidrine and Bereza (1977) that *N. ingens,* unlike the majority of unionicolids, lacks host specificity and parasitizes a broad spectrum of mussel genera.

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